terminated on the Access Interface Unit, the 5ESS can screen data calls and pass them to a data network. This structure is shown in Figure 3B.[35]

ESP/ISPs currently maintain modem pools at their interconnection points in various local areas. Such a modem pool is shown in Figure 1 at point 9.[36] The ILECs previously have suggested that they could maintain modem pools at originating central offices as a service for ESP/ISPs.[37] The Nortel and Lucent Technologies devices are really special-purpose modem pools integrated with other data communication functionality, and therefore represent a refinement of this idea.

### C. Currently Available Technology Will Allow End-Users To Access Data Efficiently at Much Higher Data Rates

While the arrangements discussed above would alleviate any congestion problems that may result from ESP traffic, they do not provide the higher access rates that consumers need to access data services. The growth of new multi-media applications, which are increasingly important to all sectors of the economy,[38] requires the deployment of reasonably priced technologies that can provide customers with access to ESP/ISPs at data rates of 1 Mbps and above.

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35 *See* Attachment A.

36 *Id.*

37 *Bellcore Working Paper, supra* n.21, at 6.

38 Many high-bandwidth medical imaging applications, for example, play a crucial role in improving health care services quality and cost management.

Technologies that expand loop capacity to accommodate these data rates are -- or soon will be -- available.

As explained in Section II, in order to facilitate data communications between an ESP/ISP and its subscriber, a modem must be located on the premises of the customer and the ESP (Points 1 and 9 in Figure 1[39]). The function of these modems is to convert the digital data signal into an analog signal that will pass through the switched connection. The connection between the two modems is limited to the voice-grade capacity defined by the ILEC network between the two modems.

If a specialized modem is placed on the customer's premises -- and if a similar device is placed either in the customer's originating ILEC central office or between the customer's premises and that office -- then the data rate can be much higher than is possible with conventional modems. Within the past few years a family of such devices has been developed, designated by the name "xDSL." Family members include HDSL, SDSL, ADSL, and VDSL. Significantly, these devices use the same twisted pair copper wire presently used for analog voice transmission to achieve much higher data rates. Figure 4[40] shows a generic arrangement using xDSL technology. In general, the closer these devices are located to the customer premises, the higher the data rate can be.

39 *See* Attachment A.

40 *See id.*

**HDSL.** The first xDSL technology, High-bit-rate Digital Subscriber Line ("HDSL"), was designed as a replacement for the earlier T-1 technology.[41] Like a T-1 line, HDSL delivers a two-way 1.544 Mbps signal over two twisted pairs. However, unlike a T-1, HDSL can operate at a distance of up to 13,000 feet from the central office without repeaters and produces less interference to adjacent pairs within a cable.[42] About 300,000 HDSL-equipped circuits are already in service throughout ILEC networks in pair-gain and similar applications.[43] Because HDSL is the most mature of the xDSL technologies, it initially may be used for ESP/ISP access by individual customers, but soon should be replaced by SDSL and ADSL technologies.[44]

**SDSL.** Single-pair, high-bit-rate Digital Subscriber Line ("SDSL") is a single-line version of HDSL that is designed to operate up to about 10,000 feet from the central office. SDSL is useful when a symmetric data rate between the

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[41] The predecessor to the HDSL technologies is the T-1 digital loop carrier system, first introduced by Bell Laboratories in the 1960s. These systems allow 24 separate 64 kbps digital voice channels to be combined into one two-way 1.544 Mbps signal. Two pairs of wires are required between terminals (one in each direction,) and a repeater is required at 3,000 feet from the central office and every 6,000 feet after that. The T-1 modulation scheme produces electrical noise that can couple into adjacent pairs in a cable, placing significant constraints on the deployment of these systems. T-1 systems initially were used for interoffice trunking, and later found application in the loop plant as *pair gain* systems. In this application, a terminal is placed in the central office and a corresponding remote terminal is placed in the loop plant at a point that is intermediate between the central office and customers. The two T-1 pair, between the central office and the intermediate point, can carry the digitized voice signals from 24 pair of loop between the intermediate point and customers. Bell Communications Research, *BOC Notes on the LEC Networks* -- 1994. SR-TSV-002275, Issue 2, April 1944 at 12-18 to 12-27. ("BOC Notes").

[42] This assumes 24 gauge, unconditioned, non-loaded cable.

[43] *XDSL: ATG's Communications & Networking Technology Guide Series.* The Applied Technology Group, Natick, Massachusetts, at 15 (1997) ("ATG Guide").

[44] Information about ADSL and other xDSL technologies may be found on the ADSL Forum's Web Site, http://www.adsl.com/(March 6, 1997).

customer and the ESP/ISP is required. SDSL will allow traditional telephone service (*i.e.*, Plain Old Telephone Service or "POTS") to be operated concurrently over the same single line with the bi-directional 1.544 Mbps digital signal. As a result, POTS could continue to receive electrical power from the central office, thereby allowing the high level of availability of present-day telephony to be maintained without added expense for reliable remote power.

**ADSL.** Asymmetric Digital Subscriber Line ("ADSL") is suitable for many applications between ESP/ISPs and their customers. Often, a low data rate from the customer to the ESP/ISP may be adequate, while a much higher data rate from the ESP/ISP to the customer is required.[45] Using only one loop pair, ADSL supports an independent POTS channel and a digital channel from the central office to the customer with a maximum data rate approximately as follows: up to 9,000 feet, 8.448 Mbps; up to 12,000 feet, 6.312 Mbps; up to 16,000 feet, 2.048 Mbps; and up to 18,000 feet, 1.544 Mbps. From the customer to the central office, data rates range from 16 kbps to 640 kbps.

All seven BOCs and GTE have ADSL trials in progress, and a company called U.S. InterAccess is already offering ADSL-based Internet access in Chicago.[46] With high-volume production, the price for a pair of ADSL modems will

[45] ADSL initially was designed to provide video-on-demand service over the loop plant -- an application that also exhibits the asymmetry described above

[46] Snider, Beth, "DSL: Coming Soon?" *Telephony*, vol. 232, no. 5, at 28-36 (February 3, 1997).

drop below $500. Further reductions in consumer prices can be expected if demand is stimulated by a competitive market.[47]

**VDSL.** Very high-bit-rate Digital Subscriber Line ("VDSL") is still being standardized, but may operate in the downstream (to the customer) direction at the following approximate maximum data rates: up to 1,000 feet, 51.84 Mbps; up to 3,000 feet, 25.82 Mbps; and up to 4,500 feet, 12.96 Mbps. Upstream rates may vary between 1.6 Mbps and 2.3 Mbps.[48]

A significant percentage of customer loops are too long to allow for the use of central-office-based xDSL technology.[49] Such customers may still be served by inserting an xDSL remote terminal between the central office and the customer's premises. Figure 5[50] shows the loop plant both with and without a remote terminal, and illustrates various xDSL configurations on the customer's premises and in the central office. On the customer's side, the xDSL modem might exist as a separate device (which might connect to a customer's computer through a direct connection or through a simple local area network), or the modem might be packaged on a card in the computer itself. In the central office, xDSL modems might be packaged

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47 Littwin, Angela, "ADSL: Ready for Prime Time?" *Telecommunications*, vol. 30, no. 12, at 35-44 (December 1996).

48 A variety of other xDSL configurations are possible, either as a function of current technology or because of further advances. Design variables include: data rate as a function of distance, data rate symmetry versus asymmetry, and the use of one or two loop pair. Further, a *rate adaptive* version of any xDSL configuration might also be implemented which permits the data rate to adjust automatically as a function of loop length and line conditions. Rate adaptive versions of SDSL and ADSL already are available.

49 Table 1 compares the various xDSL technologies.

50 *See* Attachment A.

in one of three ways: in separate xDSL modem banks,[51] as special line cards in existing circuit switches,[52] or in a device that integrates the xDSL modem bank function with other data transport functionality -- such as "Digital Subscriber Loop Access Multiplexers" or DSLAMs.

To provide access to ESP/ISPs, DSLAMs could be deployed in central offices within a metropolitan area. Traffic from these DSLAMs can then be trunked to data aggregation hubs that aggregate the traffic throughout the region. The cost of a router at such a hub should be far less than the cost of a traditional circuit switch. Such a network would be much less expensive than the ILEC circuit-switched access network used by ESP/ISPs today, and should provide every customer with a much higher data rate access than is now available.

Multiple vendors have announced that they are, or soon will be, producing DSLAMs. These systems interconnect with individual ADSL lines at the central office and provide a combined ATM signal for transport from the central office to the ESP/ISP. Since ADSL also provides an independent POTS channel, these DSLAMs also furnish a POTS interconnection to the central office circuit switch.

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51 HDSL modem banks are manufactured by PairGain Technologies and others.

52 Nortel makes a line card for their DMS-series line concentration units that combines POTS with a 1 Mbps downstream and 128 kbps upstream digital signal. This particular set of data rates is an example of a "non-standard" ADSL.

## IV. COMPETING DATA-ORIENTED TRANSPORT SERVICES ARE BOTH NECESSARY AND FEASIBLE

### A. The ILECs Have Been Slow to Deploy Existing Data-Friendly Technologies

Many of the technologies that could allow for the more efficient transport of data exist today. However, the ILECs have been slow to deploy these technologies. Perhaps the best illustration is the ILECs' long delay in deploying ISDN.

In the early 1970s, the term *Integrated Services Digital Network*, or ISDN, was coined to denote an ambitious plan to evolve the entire public network to digital. While packet switching was included as one form of ISDN, elaborate plans for circuit-switched, end-to-end digital connectivity also were incorporated. Many sophisticated business-oriented services traditionally associated with analog circuit-switched voice networks were given circuit-mode ISDN equivalents.[53]

It has taken more than 20 years for GTE and most of the BOCs to make switched ISDN available. Indeed, even today, this service has not been deployed on a ubiquitous basis. Packet mode ISDN, moreover, generally has not been offered to the public. Today, the standard ISDN Basic Rate access offers two 64 kbps B channels and one 16 kbps D channel. The two B channels can be combined, allowing a 128 kbps circuit-switched digital connection to be established between two points -- such as between an ESP/ISP and its customer.[54]

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[53] *BOC Notes* at 14-80 to 14-83.

[54] ISDN Primary Rate Access also is available, providing 23 B channels and one D channel, but this service is too expensive for access to the premises of most residential or small business

Service use has been frustrated by the ILECs' complex service-ordering process. Service pricing has been a further impediment. Residential ISDN service may involve an installation fee of $100 to $200, a monthly fee of about $25 to $50 and a usage fee for local calls of perhaps one to four cents per minute.[55] In addition, an ESP/ISP may impose an extra charge for ISDN access, and an ISDN card will be required in the accessing personal computer.[56]

Other technologies have overtaken ISDN. When ISDN initially was being defined, a typical modem operated across the analog circuit-switched network at 0.3 kbps. Such modems now commonly operate up to 33.6 kbps. Modems recently have been made available with a maximum downstream rate of 56 kbps, which is very close to the rate of one ISDN B channel.[57] As a result, circuit-mode ISDN has less and less to offer over more conventional data access arrangements. Indeed, a data rate of 128 kbps is not adequate for many multimedia applications today, and will become increasingly inadequate in the future.[58] In addition, ISDN service, unlike xDSL, requires customers to install

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customers, and would, in any case, require the recombination of more than two B channels into one higher data rate stream. In an ISDN local access arrangement, ESP/ISPs likely would access the ILEC network by ISDN Primary Rate Access.

55 *See* http://www.ocn.com/dank/isdn_ai.html.TELCO(March 5, 1997) (listing of Web links to ISDN tariff information from the RBOCs).

56 Such cards typically cost about $300, although some card manufacturers offer help in obtaining ISDN from the ILEC as a service included in this price.

57 *See* http://www.specialty.com/hiband/56k.html(March 5, 1997) (listing Web links to information on 56 kbps modems).

58 All the other elements required for innovative computer and communications applications are becoming more capable -- including microprocessors, memory and longer-distance digital

specialized customer premises equipment in order to simultaneously use voice telephone and data services.

In light of this history, it is clear that -- so long as they are not subject to effective competition -- the incumbent LECs lack effective incentives to deploy the new technologies needed to accommodate the growth of data calls in a timely and cost-effective manner. Rather, the ILECs' historical reaction has been to expend revenues on existing circuit-switched technologies, while advocating measures -- such as the imposition of carrier access charges -- that would have the effect of suppressing demand for ESP/ISP offerings.

### B. Competitive Provision of Data Transport Services is Technically and Economically Feasible

Competing providers could offer service that would allow for the high-speed transport of data between the customer and ESP/ISP's premises. While some competitors might eventually deploy their own end-to-end facilities, initial entry would likely involve a combination of the entrant's facilities and those of the incumbent LEC. For this to occur, several technological, operational, and administrative issues need to be addressed.

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transmission systems. *See* National Research Council, *The Upredictable Certainty -- Information Infrastructure Through 2000,* Washington, National Academy Press, at 3 (1996). If consumers are to realize the full benefits of these new technologies, public local data access must keep pace.

### 1. Collocation and Subloop Unbundling

As discussed in Section III, above, xDSL technology can allow subscribers to use the existing local loop to access the Internet and other on-line services at significantly higher data rates than are now available. Deployment of this technology requires that a specialized modem be placed at the customer's premises and that a paired device be located *either* at the serving end-office or at some point between the end-user and the end-office.

In order for xDSL functionality to be deployed on a competitive basis, service providers must be allowed to install xDSL modems within the incumbent's network. In some cases, it will be possible to provide xDSL service by locating the modem in the ILEC's serving end-office. As shown in Table 1,[59] however, a significant fraction of customer premises cannot be reached by current xDSL systems from the serving wire center end-office.[60] If competing data service providers are to be able to deploy xDSL technology, the incumbent LECs must be required to offer the loop components competitors need, and allow competing service providers to obtain those elements necessary to provide service at an economically rational price.

Competing providers also will need the ability to install necessary equipment for use with ILEC network components. Figure 6 illustrates a situation

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59 Table 1 is included herewith as Attachment B.

60 The loop plant is an imperfect transmission medium (as is any other physical means of electrical or optical transmission). These imperfections cumulate with distance, placing an upper limit on the useful transmission length of any physical pathway.

in which a competitor has obtained space within an ILEC wire center or serving end-office.[61] Inside the wire center, a cable connects at the main distribution frame and takes the loops from the competitor's customers to equipment that is located inside the competitor's collocation space.[62]

Figure 6 also shows a typical loop plant configuration.[63] Major components of the loop plant are the feeder plant, the feeder distribution interface, and the distribution plant. The feeder plant consists of larger cables that emanate from an end-office. Each feeder terminates at a point outside the central office called the feeder distribution interface. This interface is a small version of the main distribution frame found in the wire center, and allows pairs from the feeder plant to cross connect with pairs from the distribution plant. Beyond this interface, the distribution plant consists of smaller cables that ultimately connect to the network interface device located outside individual customer premises.

Loop lengths that exceed the operational parameters for xDSL systems can result in reduced bit-rates or other performance degradations. In such cases, a remote terminal for an xDSL system can be placed at the feeder distribution interface (or some similar point) and connected to a copper pair in the feeder plant and a copper pair in the distribution plant. This arrangement would create a high-

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61 *See* Attachment A.

62 In many cases, it may be possible to *eliminate* the need to transport some data from the central office to the ESP/ISP's premises by allowing ESPs/ISPs to collocate enhanced service equipment -- such as file servers -- at the central office. Such collocation is plainly feasible. Indeed, the ILECs have long collocated equipment that *they* use to provide enhanced services.

63 *See* Attachment A.

data-rate channel between the wire center and the customer. Alternatively, a fiber-optic cable could be deployed in the feeder, and loop electronics might be placed at the remote terminal in order to allow a very high data rate on the (relatively short) distribution cable to the customer. In either of these cases, subloop unbundling would be required because a competitor would need to locate equipment at or near the feeder distribution interface in the loop plant.[64]

### 2. Competitively Neutral Access to Loop Capacity

An xDSL-modem (or any similar type of future apparatus) could also be used to provide two or more simultaneous and independent paths between the customer and the serving wire center. This would allow for the simultaneous provision of voice and data services by multiple providers over the same loop facility. Physically, such a modem could be packaged as one device or as two or more coordinated devices. In any case, each of the data channels could be routed to a different data service provider at the serving wire center. Further, while a particular data channel might default to a particular service provider (in analogy to the primary toll carrier in voice) the selection of an alternative on a per-call (or per-data transport session) basis might also be allowed. Thus, an ILEC and competing data providers could be served by the same loop, without regard to sub loop unbundling.

[64] The demand for higher data rates will continue, and innovations in xDSL systems will attempt to meet these need. Despite further developments in xDSL technologies, there will always be a fundamental tradeoff between loop length and data rate. There will always be a need to resolve this tension by collocating electronics in the loop plant -- beyond the wire center and closer to the customer. This will require subloop unbundling.

### 3. "Equal Access" to Data Traffic For Competitive Packet Networks

Many equipment manufacturers are beginning to offer new types of switch adjuncts, multiplexers, and similar devices for central office use. Such devices interface with customer lines, concentrate the resulting data traffic, and route the traffic from the wire center using data-friendly transmission services to its destination. An examination of the product literature for these systems shows that none of them seem to have been contemplated for a competitive local telecommunications environment. For example, the Nortel Internet Thruway™ and the Lucent Technologies Access Gateway™ allow data traffic to be separated from POTS traffic at the ILEC central office and, from there, routed over a packet network to the receiving ESP/ISP's point of presence. These devices appear to allow only one entity to transport the data from any given customer line. There is no reason, however, why such technology could not be used to allow competing entities -- whether ILECs, alternative data communications providers, or ESP/ISPs themselves -- to transport data from the central office to the ESP/ISP's premises.

### 4. Loop Management Issues

Systems such as ADSL may receive interference from other loop electronics, such as the original T-1 loop carrier system.[65] In order to prevent such interference, the incumbent carrier must perform loop spectrum management

[65] For a discussion of T-1 carrier systems, *see supra* n.31. For a discussion of loop interference, *see supra* n.33 at 17.

functions.[66] Further, the previous deployment of *any* loop electronics system by an ILEC may mean that a particular customer is not served by a clear copper channel -- a continuous metallic path from the central office to the customer's premises. If so, then the deployment of an xDSL system to that customer requires a cable rearrangement.[67]

These problems can be resolved through the establishment of a procedure that allows loop occupants and the underlying carrier to coordinate with one another in order to avoid interference and obtain the required loop resources. Any such process must ensure that the loop spectrum and resource manager does not discriminate against any user.

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66 The vast majority of the nationwide loop plant was never intended for use with loop electronics, but was designed for *baseband signals*. In such signals, the frequency of the sound being transmitted is the same as the frequency of the electrical signal in the cable. With loop electronics, a much higher frequency signal (called the *carrier*) is imposed upon the cable. This carrier is then modulated by a signal containing the information to be carried. By this means, much more information can be conveyed over a loop pair, but the probability of coupling unwanted energy into adjacent cable pairs is increased. This coupling is called *crosstalk*. (No similar problem exists with trunks, because trunk cables used with trunk electronics generally are designed for such use.) In traditional ILEC practice, the installation of a loop electronics system (such as the original T-1 digital loop carrier system) required testing to select a loop pair suitable for carrying the signal. This meant that the bit error rate of the signal had to be adequately low, and that interference from adjacent loop pairs in the cable had to be acceptable. Most important of all, interference from the new system to existing pairs had to be within bounds. Such a procedure is an example of *loop spectrum management*.

67 For all reporting companies (the RBOCs and GTE) in 1993, the number of equipped loop channels was 210.5 million, while the number of working channels (*i.e.*, channels in use) was 132.4 million. Kraushaar, Jonathan M., *Infrastructure of the Local Operating Companies Aggregated to the Holding Company Level*, Industry Analysis Division, Common Carrier Bureau, Federal Communications Commission, April 1995, Table 10 (b). This suggests that a large number of loop channels are available nationwide for rearrangement purposes, but does not establish the availability of a loop pair on any particular cable route.

### 5. Systems for Loop Operations and Planning

The ILECs have installed many computerized systems for activating and maintaining individual customer loops and for planning and implementing additions to the overall loop plant. These systems perform many loop management functions -- including planning, engineering, provisioning, administering and testing. Such systems currently are more oriented to entire loops than to subloop elements. For data-oriented local competition to prosper, ILEC provisioning and billing practices must be adapted to subloop unbundling. In addition, competing data service providers will need access to these systems, access to related planning data, and representation in the associated loop planning processes.

## C. Cable, Wireless and Satellite Competitors Have the Potential To Provide Data Transport Services in the Future

There are a number of other potential sources -- such as cable systems and wireless technologies -- that ultimately may provide alternative means for high speed data transport. However, each of these technologies face significant hurdles before they can provide a viable alternative to loop-plant-based solutions. Thus, while the Commission's policies should foster the long-term deployment of these alternative infra structures, they cannot now provide the competitive alternatives necessary to accommodate the growing demand for Internet and other data services.

**Cable.** The cable infrastructure was intended for the one-way distribution of video programming, but can be adapted for use as an alternative means of connecting to the Internet and other enhanced services. This would require two significant changes: the upgrade of the existing cable infrastructure and the commercial deployment of cable modems.

A cable plant configured for data access would need to have a fiber-optic route from the central point ( the "headend") to intermediate nodes serving perhaps 500 to 2,000 homes.[68] From such nodes, traditional coaxial cable plant would go to individual subscribers. A single 6 MHz (traditional video) channel in the fiber-optic portion of the hybrid fiber-coaxial plant would be used to derive a downstream (to customers) data rate of between 10 and 30 Mbps (depending on the specifics of the modem design). The downstream data channel would have to be shared among all the active data users served by the intermediate node. If this data rate is inadequate, additional 6 MHz channels might be used. The upstream data rate probably would be considerably less, and the cable plant would require further modification to support an upstream channel.[69]

Most cable customers in the United States currently are not served by such plant. According to one report, only five to ten percent of all U.S. homes are served by cable networks that allow two-way data communications.[70] Rather, most cable television systems use a so-called "tree and branch" architecture, which is optimized to deliver one-way signals on a point-to-multipoint basis. In this design, a single signal originates from a central point and then radiates out over multiple

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[68] The "headend" in cable television is analogous to the "wire center" or "central office" in telephony.

[69] Information on cable modems and related matters may be found at *Cable Modem Resources on the Web.* http://rpcp.mit.edu/~gingold/cable/(March 6, 1997).

[70] "Cable TV's Infrastructure Advantage," *Communications Week* at 29 (December 9, 1996).

branches. The cable television industry currently is facing financial and competitive pressures that may reduce the likelihood that it will make the necessary upgrades in the near-term.[71]

Use of the cable infrastructure for two-way data applications also will require the deployment of *cable modems*. Such "modems" -- which may in fact combine the functions of modems as well as tuners, encryption/decryption devices, bridges, routers and Ethernet hubs -- typically are located on customers' premises. For high-data rate access, cable modems have an inherent advantage over xDSL-based solutions. The multiplexed signal from many customer-premises cable modems appears at the headend, so one device can form the mate for many modems in the field. In contrast, while a central-office-based xDSL modem bank can share some common costs across the individual line terminations, significant costs associated with each line remain.[72]

**Wireless.** Currently available radio-based systems provide alternatives to wireline data services, but do not now offer high data-rates. Wireless local area networks operate over a very limited geographical span, such as within a building. Metropolitan-area systems, such as the Metricom Ricochet™ network, operate at data rates comparable to current wireline-based modems.[73] AT&T recently has

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71 "Cable TV: A Crisis Looms," *Business Week* at 101-106 (October 14, 1996).

72 On the other hand, xDSL modems can be deployed on a per-line basis as the market develops, while cable modems require a hybrid fiber-coaxial plant before any data services can be offered.

73 The Metricom Ricochet™ system uses unlicensed, microcell, spread-spectrum, packet radio to provide access to mobile computers at data rates in the range of 14.4 to 28.8 kbps. Ricochet systems have been deployed in Washington, D.C., San Francisco and Seattle.

announced a wireless, local loop system based upon digital PCS technology. This system will operate at 128 kbps, which is faster than the Metricom Ricochet™ system, but still short of the data rate required for many multimedia applications.[74]

Higher data rate metropolitan-area wireless systems (*i.e.*, at 1 Mbps and above) generally are not available, because issues of spectrum licensing and equipment remain unresolved. The Multipoint Multichannel Distribution Service ("MMDS") might be adapted for data use, although MMDS initially was more oriented toward the delivery of video. Another possibility is the Local Multipoint Distribution Service ("LMDS"). Various technical problems (such as those concerning propagation) need to be resolved before LMDS can be used for data, but the amount of spectrum available for this service makes the long-term possibility of using LMDS for high-data-rate access attractive.[75]

**Satellite.** Satellite-based wireless data access presently is available from Hughes Network Systems' DirecPC™, which offers a 400 kbps downstream channel with the return channel from the customer requiring a terrestrial link. While most low earth orbit satellites are oriented toward voice, Teledesic plans to launch a system of data-oriented, two-way, low earth orbit satellites starting in the year 2000. The Teledesic design is very ambitious, and in the long term may provide a new level of worldwide data connectivity.

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[74] "AT&T Unveils 'Revolutionary' Fixed Wireless System To Bypass Telcos' Local Loop 'Roadblock,'" *Telecommunications Reports* (March 3, 1997).

[75] The *IEEE Communications Magazine* for January 1997 contains several articles on wireless, high-data-rate communications systems.

## V. THE COMMISSION SHOULD REVISE ITS RULES TO STIMULATE THE COMPETITIVE DEPLOYMENT OF "DATA-FRIENDLY" NETWORKS AND SERVICES

In 1996, Congress enacted the pro-competitive Telecommunications Act, the purpose of which was

> to establish a pro-competitive, de-regulatory national policy framework designed to accelerate rapidly private sector deployment of advanced telecommunications and information technologies and services to all Americans by *opening up all telecommunications markets to competition.*

S. Conf. Rep. No. 104-230, 104th Cong., 2d Sess. (1996) (*Joint Explanatory Statement*) (emphasis added). The 1996 Act requires, among other things, that the Commission initiate proceedings to open local monopolies to competition.[76]

In the *Local Competition*[77] proceeding, the Commission took the first step towards opening the local exchange and exchange access markets to competition by unbundling local exchange carriers' local service elements and defining the rates at which those "unbundled network elements" could be offered. The Commission explained that

> under the 1996 Act, the opening of one of the last monopoly bottleneck strongholds in telecommunications – the local exchange and exchange access markets – to competition is intended to pave the way for enhanced competition in *all* telecommunications markets, by allowing all providers to enter all markets. The opening of all telecommunications markets to all providers will blur

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[76] 47 U.S.C. §§ 251, 254.

[77] *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, 11 FCC Rcd 15,499 (1996) ("*Local Competition Order*"), *petition for review pending sub nom. Iowa Utilities Board v. FCC*, No. 96-3321 (8th Cir.).

> traditional industry distinctions and bring new packages of services, lower prices and increased innovation to American consumers.

*Local Competition Order* at 15, 506.

The final stage of what the Commission has dubbed the "Competition Trilogy"[78] is the access reform proceeding initiated in conjunction with the instant docket.[79]

For decades before the passage of the Act, however, the Commission has emphasized the importance of competition to reducing the cost of telecommunications services and equipment, increasing consumer choice, and spurring innovation.[80] Nearly fifty years ago, in *MacKay Radio and Telegraph Co.*,[81] the Commission wrote, "The national policy of the United States is one favoring competition. . . . . Competition can generally be expected to provide a powerful incentive for the rendition of better service at lower cost."[82]

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78 *Id.* at 15,507.

79 *Access Charge Reform,* CC Dkt. No. 96-262, *Notice of Proposed Rulemaking*, FCC 96-488 (rel. Dec. 24, 1996).

80 The policy of promoting competition where possible has its roots in the Communications Act and in the Interstate Commerce Act, 49 U.S.C. §§ 10501, *et seq.*, the model for the Communications Act. Section 1 of the Communications Act, 47 U.S.C. § 151, charges the Commission with regulating telecommunications so as to protect the public interest, convenience, and necessity. In *FCC v. RCA Communications, Inc.*, 346 U.S. 86 (1953), the Supreme Court held that in determining whether a communications service is in the public interest, "competition is a relevant factor." *Id.* At 94. Similarly, when it interpreted the Interstate Commerce Act in *Schaffer Transportation Co. v. United States*, 355 U.S. 83 (1957), the Supreme Court wrote that "no carrier is entitled to protection from competition . . . nor should the public be deprived of a new and improved services because it may divert some traffic from other carriers." *Id.* at 91.

81 15 F.C.C. 690 (1951)

82 *Id.* at 734.

Twenty years later, in *Specialized Common Carrier Services,*[83] the Commission rejected opposition to policies promoting the entry of competing specialized carriers, writing:

> In proposing a policy favoring the entry of new specialized common carriers, we look toward the development of new communications services and markets and the application of improvements in technology to changing and diverse demands. . . . By permitting the entry of specialized carriers, we would provide users with flexibility and a wider range of choices as to how they may satisfy their expanding and changing requirements for specialized communication service.

*Specialized Common Carrier Services,* 29 F.C.C.2d at 876.

These pro-competitive policies were affirmed in the Commission's *Domsat,*[84] *Computer Inquiry,*[85] and *Resale and Shared Use*[86] proceedings, and they apply with greater force today.

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[83] *Establishment of Policies and Procedures for Consideration of Applications to Provide Specialized Common Carrier Services*, 29 F.C.C.2d 870, *recon.*, 31 F.C.C.2d 1106 (1971), *aff'd sub nom. Washington Utilities and Transportation Commission v. FCC*, 513 F.2d 1142 (9th Cir. 1975), *cert. denied*, 423 U.S. 836 (1975).

[84] *Establishment of Domestic Communications-Satellite Facilities by Non-Governmental Entities*, 35 F.C.C.2d 844 (1972).

[85] *First Computer Inquiry*, 28 F.C.C.2d 267 (1971), *aff'd in part sub nom. GTE Service Corp. v. FCC*, 474 F.2d 724 (2d Cir. 1973), *decision on remand*, 40 F.C.C.2d 293 (1973); *Second Computer Inquiry*, 77 F.C.C.2d 384 (1980), *mod.*, 84 F.C.C.2d 50 (1980), *aff'd*, 693 F.2d 198 (D.C. Cir. 1982); *Third Computer Inquiry, Phase I*, 104 F.C.C.2d 958 (1986), *mod. on recon.*, 2 FCC Rcd 3035 (1987), *further recon. denied*, 4 FCC Rcd 5927 (1989), *Third Computer Inquiry, Phase II*, 2 FCC Rcd 3072 (1987), *recon. den.*, 3 FCC Rcd 1150 (1988), *further recon. den.*, 4 FCC Rcd 5927 (1989), *vacated sub nom. California v. FCC*, 905 F.2d 1217 (9th Cir, 1990), *on remand*, 5 FCC Rcd 5242 (1990).

[86] *Regulatory Policies Concerning Resale and Shared Use of Common Carrier Domestic Public Switched Network Services,* 83 F.C.C.2d 167 (1980) (subsequent history omitted).

Many of the pro-competitive proceedings required by the Act focus on expanding competition in the provision of common carrier services, and voice telephony in particular. For example, the rulemaking implementing the local competition provisions in Section 251 of the Act established the rights and responsibilities of new local exchange companies who would compete with the ILECs in the provision of basic common carrier voice telephony.

The marketplace failures associated with non-competitive telephony services are of equal concern to customers and providers of data services, including both providers of enhanced services and providers of regulated data transmission services. Because the ILECs have faced, and still face, no substantial competition in their markets, they have failed to provide the innovative data services that could be used by consumers or by potential ILEC data service competitors, and they have failed to keep their local exchange networks technologically up-to-date and technologically prepared for the growth in data traffic.

As described in Sections III and IV, there are a variety of technologies, some of which have been available for over two decades, that would enable ILEC networks to handle data traffic more efficiently and deliver higher bandwidths to consumers and service providers than they currently do. But in the absence of meaningful competition in the data services market, the ILECs have either ignored, sporadically deployed, or over-priced these technologies despite years of steadily increasing consumer demand for faster, more efficient data services.

Because competition in local markets would provide the only effective incentive for the ILECs to keep their networks technologically current, the Commission should adopt regulations in this proceeding that facilitate competitive entry by alternative data service providers.

The Coalition does not advocate a regulatory system that is biased in favor of any technology or service provider. Both ILECs and their competitors should have the same opportunities to compete for customers with a variety of innovative service offerings. Therefore, the Commission should not adopt a regulatory approach that would hamper the ILECs' ability to compete aggressively nor should it perpetuate a regulatory regime that impedes competitive entry. The Commission's rules and policies should facilitate the emergence of meaningful competition to maximize consumer choice and stimulate the offering of diverse data services based on technological and marketplace conditions which may vary across exchanges.

### A. Eliminate Barriers to the Competitive Deployment of Data-Friendly Technologies

The Commission's regulatory regime for access was designed for a closed-market local exchange environment in which a single provider offered the facilities and services necessary for the delivery of circuit-switched voice telephony. As a result, Part 69 did not establish access elements that define the services needed for the efficient delivery of data services. The Commission's voice-oriented access elements impeded the competitive entry of alternative data service providers by requiring potential ILEC competitors to pay for services, features, and functions they did not need and could not use for data applications.

The Commission subsequently modified the Part 69 access rules when it adopted its Open Network Architecture ("ONA") rules.[87] The ONA rules ostensibly required the BOCs to provide services useful to ESP/ISPs by unbundling their services into basic transmission offerings -- called Basic Serving Arrangements or "BSAs" -- and optional features that could be useful to ESPs -- called Basic Service Elements or "BSEs." As a practical matter, however, the ONA rules left access offerings virtually unchanged; BSAs were simply a new name for bundled Part 69 elements (loop, switching, and transport).[88]

The Commission modified its rules to accommodate emerging competition in the ILECs' markets in the *Expanded Interconnection*[89] and *Transport Rate Structure*[90] proceedings. The rules revised Part 69 to give the ILECs greater

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[87] *See Amendment of Part 69 of the Commission's Rules Relating to the Creation of Access Charge Subelements for Open Network Architecture*, 4 FCC Rcd 3983, *Notice of Proposed Rulemaking*, (1989); *Report and Order on Further Reconsideration and Supplemental Notice of Proposed Rulemaking*, 6 FCC Rcd 4524 (1991) ("ONA Report and Order"); *Memorandum Opinion and Order on Reconsideration*, 8 FCC Rcd 3114 (1993) ("*ONA Reconsideration*"), *vacated and remanded, MCI v. FCC*, 57 F.3d 1136 (D.C. Cir. June 27, 1995).

[88] *ONA Reconsideration*, 8 FCC Rcd at 4526. ("The switched service BSA is essentially a combination of the existing common line, local switching, and transport elements that does not include existing features offered as BSEs"). *See also Filing and Review of Open Network Architecture Plans*, CC Dkt. No. 88-2, Phase I, *Memorandum Opinion and Order*, 4 FCC Rcd 1, 36 (1988).

[89] *Expanded Interconnection with Local Telephone Company Facilities*, CC Docket No. 91-141, *Report and Order and Notice of Proposed Rulemaking*, 7 FCC Rcd 7369 (1992) (*"Expanded Interconnection Order"*); *Second Report and Order and Third Notice of Proposed Rulemaking*, 8 FCC Rcd 7374 (1993); *Third Report and Order*, 9 FCC Rcd 2718 (1994).

[90] *Transport Rate Structure and Pricing, Report and Order and Further Notice of Proposal Rulemaking*, 7 FCC Rcd 7006 (1992), *First Memorandum Opinion and Order on Reconsideration*, 8 FCC Rcd 5370 (1993), *Second Memorandum Opinion and Order on Reconsideration*, 8 FCC

pricing flexibility and to establish certain interconnection rights for a handful of new providers offering high capacity links that could be used in lieu of Part 69 special access or switched transport.

These proceedings did not fundamentally or comprehensively alter the ILECs' basic access services in a manner that would establish the features and functions needed for efficient competitive data services. More importantly, the rules as modified do not encourage ILEC deployment of the data-friendly network technologies described in Sections III and IV, nor do they allow competing providers of data services to deploy those technologies.

Accordingly, the Commission should use this proceeding to identify the regulatory policies and rule revisions that would enable, rather than delay, deployment of these technologies by multiple providers, including both ILECs and their potential competitors. As noted above, the most effective regulatory policy for this purpose would be to eliminate barriers to competitive entry for data service providers. This would not only allow competitors to deploy modern data transport technologies, but would spur the ILECs to do the same. The Commission cannot by regulation create incentives to upgrade local networks that would be as powerful as competition.

The following paragraphs describe specific regulatory changes consistent with these goals. The Commission should first require the ILECs to offer Part 69 access elements on an unbundled basis. Second, the ILECs should offer

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Rcd 6233 (1993), *Third Memorandum Opinion and Order and Reconsideration and Supplemental Notice of Proposed Rulemaking*, 10 FCC Rcd 3030 (1994).